

WHAT IS CLAIMED IS:

1. A fabrication method of a semiconductor device comprising:
forming a pad oxide layer and a nitride layer sequentially on a silicon substrate, and forming a photoresist pattern for trench formation on the nitride layer;
etching the nitride layer and the pad oxide layer using the photoresist pattern as a mask while etching the silicon substrate to form a trench using the nitride layer as an etch stopper;
filling the trench by depositing an oxide layer for trench gap filling on entire surface of the silicon substrate; and
performing planarization which makes the gap filling oxide exist only in the trench.
2. A fabrication method as defined by claim 1, wherein the planarization of the gap filling oxide is performed by polishing the gap filling oxide by chemical mechanical polishing using the nitride layer as a buffer layer after filling up the trench with the gap filling oxide.
3. A fabrication method as defined by claim 1, wherein the planarization of the gap filling oxide is performed by etch-back process.
4. A fabrication method as defined by claim 1, wherein thickness of the photoresist layer is determined to make the photoresist layer be removed simultaneously by etching of the nitride layer and the silicon substrate.
5. A fabrication method as defined by claim 4, wherein thickness of the photoresist which remains on the nitride layer before etching of the silicon substrate is 1000 Å - 3000 Å if depth of the trench to be formed is 4000 Å - 6000 Å.
6. A fabrication method as defined by claim 1, further comprising over-etching the nitride layer at the etch stop point in which the photoresist pattern is completely etched after the formation of the trench.
7. A fabrication method as defined by claim 6, further comprising forming a thermal oxide layer on inner wall of the trench by thermal oxidation process between the over-etching and the trench filling.